REMARKS

This is in response to the Office Action dated 10/7/03.

Claims 1, 2, 4, 5, 8 and 9 are now pending in the application.

Claims 15-20 remain withdrawn from consideration.

Claims 1, 2, 4, 5, 8, 9 are rejected under 35 USC 112, first paragraph. The problem is with "elastic modulus between 1 and 15 GPa", considered to be new matter.

The objected to language is canceled from **claim 1**.

Claims 1, 2, 4, 5, 8, 9 are rejected under 35 USC 112, second paragraph. The problem here is that it is not clear how the elastic modulus between 1 and 15 GPa is measured.

This rejection is traversed by the aforementioned amendment to **claim 1**.

Substantive Grounds of Rejection

Claims 1, 2, 3, 5, 8, 9 are rejected under 35 U.S.C. 1 03(a) as being unpatentable over Welter (US 4,262, 726) or Iwata et al. (US 4,842,682) or Cluzel (US 5,996,662) taken in view of Oare et al. (US 51368,082), EP 335,588 to Sumitomo and GB 1,487,426 to Verbauwhede. The Office Action states that:

"Applicant points out that Welter does not suggest winding to form the relevant ply. While this is agreed with, it is submitted that in this art, when forming plies that have cords oriented at essentially zero degrees to the equator, it is extremely well known and common to form these plies by winding a ribbon at a low angle with adjacent windings adjoining one another rather than as a single wrap ply with a splice - GB '426 and EP '588 were applied as merely exemplary. To form the low angled plies of the Welter by winding a ribbon would therefore have been obvious and furtrher would have provided the well known and expected benefit of avoiding the material splice (and its concurrent non-uniformities as well as potential weakness) that would otherwide be required in applying a full width ply."

"As to Iwata et al . '682, it is argued that the underlay cords in this reference are steel cords and therefore are completely different from the claimed cords. While it is agreed that Iwata seems to prefer steel cords for the underlay, it is apparent that the reference is not so limited in terms of the cord material for the underlay -note for example col. 2, lines 23+ and col. 5, lines 13+ .It would

seem that the principal requirement for the cords is that they have above a certain lower modulus limit, not necessarily that they be steel Substitution with other well known very high modulus cord materials (e.g. such as glass or aramid/Kevlar) would therefore have been obvious in light of the guidance provided by this reference and would seem to meet the claimed material requirement."

"As to Cluzel, while it also seems to only exemplify steel, it would seem that the material is not critical to the invention as long as it is high modulus -note for example claim 1 of the patent, which mentions the material for the other belt plies but not the ply 20. As such, absent some showing to the contrary, the artisan would have found it obvious to substitute other well known very high modulus materials, particularly aramid."

"The arguments with respect to the secondary references have also been carefully considered but are not persuasive as these references principally were directed at there are features that distinguish some specific teachings in these references from that claimed, most of these teachings ,have been provided by the primary references and it has not been shown why the artisan would have considered the basic inclusion of run flat inserts or zero degree strip winding to be incompatible with the teachings of these primary references."

The Invention

The invention relates generally to a pneumatic radial ply runflat tire comprising a tread, two insert reinforced sidewalls, two inextensible annular beads, a radial ply structure having one or more radial plies, and a belt structure located between the tread and the radial ply structure, the runflat tire characterized by a fabric underlay deployed between the belt structure and the radial ply structure for supporting tensile loads during both normal-inflated and runflat operating conditions.

The fabric underlay 60 shown in FIGURES 2 and 3 has high-modulus fibers or cords 62 that are aligned approximately circumferentially, as shown in FIGURE 4. The width of the fabric underlay 60 is approximately equal to the width of belt structure 16, preferably slightly wider than the belt structure. (page 19, lines 19-24)

FIGURES 4A and 4B are schematic views showing the circumferential orientation of the reinforcing cords 62 of the fabric underlay 60. The tensile-stress-bearing cords 62 shown in FIGURE 4 are more or less parallel to the equatorial plane EP as viewed from a direction normal to the tread 12 (which is not shown in FIGURE 4). That is, as shown in FIGURE 4B, the reinforcing cords 62 of the fabric underlay 60 are oriented at a cord angle CA of about 0 degrees to about 30

degrees with respect to the equatorial plane EP, preferably between about 0 degrees and about 20 degrees, but most preferably about 0 degrees with respect to the equatorial plane EP of the tire 10. (page 19, lines 13-24)

Cords 62 in FIGURES 3, 4A and 4B are high-modulus synthetic or textile cords constructed from the group of materials that includes, but is not limited to polyester, nylon, rayon, aramid, glass and other rigid, high-modulus materials. (page 19 lines 25 to page 20 line 3)

The fabric underlay 60 is applied upon the green carcass after the blow-up process on a conventional tire building drum as is well known in the art. That is, the fabric underlay is applied to the green carcass after the carcass is initially blown up but prior to being "blown-up" into the belt and tread. There are two methods by which the fabric underlay 60 can be applied upon the blown up green carcass. The first method is to apply the fabric underlay 60 as a single "ply" having approximately the width of the tread. In this first method of installation, the reinforcement cords are inclined between about 0 degrees and about 30 degrees with respect to the equatorial plane EP of the tire, preferably between about 0 degrees and about 20 degrees with respect to the equitorial plane EP, and most preferably at about 0 degrees with respect to the equatorial plane EP. (page 32, lines 6-21)

The second method by which to install the fabric underlay 60 is by helically or spirally winding a ribbon of cord-reinforced, uncured rubber around the blown-up, green carcass. In this second method of application, the reinforcing cords 62 are disposed at an angle of between about 0 degrees and about 5 degrees with respect to the equatorial plane EP. The ribbon can be laid "lap" or "butt," which means that laterally adjacent portions of the ribbon can overlap or not, respectively. Normally the construction is butt in order to have uniform reinforcement and also to avoid the trapping of air under the overlapping layers of rubber. (page 32, line 21 to page 33 line 7).

Traversing the Rejection

Claim 1 (as amended herewith) describes a fabric underlay deployed between the belt structure and the radial ply structure for supporting tensile loads during both normal-inflated and runflat operating conditions, the fabric underlay comprising high-modulus reinforcing cords being aligned at a cord angle of about 0 degrees to 5 degrees with respect to the equatorial plane of the tire, the fabric underlay comprising a helically wound ribbon of cord-reinforced rubber wherein the ribbon is butt joined against laterally adjacent potions of the ribbon without overlapping; and

the high-modulus reinforcing cords of the fabric underlay are made of high-modulus material selected from the group consisting of polyester, nylon, rayon, aramid and glass.

The combination of these features are not shown or suggested by the references cited. The Examiner agrees that the main reference (Welter) "does not suggest winding to form the relevant ply." The Examiner states that "it is extremely well known and common to form these plies by winding a ribbon at a low angle with adjacent windings adjoining one another rather than as a single wrap ply with a splice - GB '426 and EP '588 were applied as merely exemplary."

Welter (US 4,262,726) discloses a belt underlay, or carcass overlay 20 is interposed between the belt structure 13 and carcass ply 7. The carcass overlay 20 is adjacent to the carcass ply 7 and has lateral margin edges 21, 22 which extend beyond the belt structure 13 into the sidewalls 9, 10 of the tire 5, but terminate short of the maximum flex zones, or areas 23, 24 of the sidewalls 9, 10. The maximum flex zones 23, 24 are normally at the thinnest section of the sidewalls 9,10 of the tire 5, such sections usually being at about the maximum width or section diameter SD of the tire 5. The carcass overlay 20 (FIG. 2) consists of a single ply which is reinforced with parallel cords 25 that extend substantially circumferentially of the tire 5, i.e. at cord angles E in the range of from 0 to 13 degrees relative to the centerplane. The carcass overlay 20 has no effect on ply steer, i.e. the tendency of the tire construction to move the tire in a lateral direction, when the reinforcement cords 25 thereof are at very low angles of about zero degrees. The carcass overlay 20 has a decided effect upon the reduction of ply steer when the reinforcement cords 25 are disposed at angles of 4 degrees or more, and preferably around 8 degrees which seems to be the optimum cord angle for eliminating ply steer without seriously affecting the restrictive effect of the low angle reinforcement cords 25. Thus, the preferred cord angles of the reinforcement cords 25 are in the more selective range of from 4 to 13 degrees relative to the centerplane. The reinforcement cords 25 of the carcass overlay 20 extend in the same general direction from the centerplane as do the reinforcement cords 17 of the nearest belt ply 15. (column 2, lines 18-48)

Welter's belt underlay, or carcass overlay 20 (FIG. 2) consists of a single ply reinforced with parallel cords. The fabric underlay of the present invention is a ***helically wound ribbon***. Welter's cords are disposed in the range of from 0 to 13 degrees, and preferably around 8 degrees.

The cords of the present invention are disposed at about 0 degrees to 5 degrees. Welter's cord is described as "a highly elongatable reinforcement cord 25 (FIG. 3) having a core 26 with a spiral wrapping of a pair of inextensible yarns 27,28 which are of opposite lay and which are composed of any suitable material such as rayon, nylon, polyester, aramid, or metal. The core 26 is of a material having a relatively low tensile, which loses tensile strength when subjected to elevated temperatures, such as a polymer selected from the group consisting of polyolefines including polyethylene and polypropylene. (paragraph bridging columns 2-3) The cord materials of the present invention are high-modulus material selected from the group consisting of polyester, nylon, rayon, aramid and glass

US 4,262,726 to Welter discloses a single ply which is reinforced with parallel cords. However, as stated by the Office Action, Welter does not specifically indicate how the ply is formed. This is a very important feature of the present invention where the fabric underlay is claimed as "comprising a helically wound ribbon of cord-reinforced rubber wherein the ribbon is butt joined against laterally adjacent potions of the ribbon without overlapping". This feature is not shown or suggested by Welter.

U.S. 4,842,682 to Iwata discloses an underlay made of steel cords, i.e., non-expansible or hardly expansible. This is completely different from the present invention where the cords are claimed as being "made of high-modulus material selected from the group consisting of polyester, nylon, rayon, aramid and glass".

U.S. 5,996,662 to Cluzel discloses an underlay made of steel cords, i.e., non-expansible or hardly expansible. This is completely different from the present invention where the cords are claimed as being "made of high-modulus material selected from the group consisting of polyester, nylon, rayon, aramid and glass". In addition, the forming angles of the metal cables are between 15^0 and 35^0 as compared with 0^0 and 5^0 for the present invention.

U.S. 5,368,082 to Oare discloses reinforcing belts underlying the tread having cord angles from are between 17^0 and 27^0 as compared with 0^0 and 5^0 for the present invention. Also, the cords of the reinforcing belts are disclosed as steel instead of as being "made of high-modulus material selected from the group consisting of polyester, nylon, rayon, aramid and glass". In addition, there is no mention or suggestion of a very important feature of the present invention where the fabric underlay is claimed as "comprising a helically wound ribbon of cord-reinforced rubber wherein the ribbon is butt joined against laterally adjacent potions of the ribbon without overlapping".

Accordingly, if one skilled in the art were to modify Welter or Iwata et al. or Cluzel with the teachings of Oare et al., the resulting structure would still not include an underlay deployed between the belt structure and the radial ply structure that:

a) comprises high-modulus reinforcing cords being aligned at a cord angle of about 0 degrees to 5 degrees with respect to the equatorial plane of the tire,

b) is a wound ribbon of cord-reinforced rubber wherein the ribbon is butt joined against laterally adjacent potions of the ribbon without overlapping;

c) the high-modulus reinforcing cords of the fabric underlay are made of high-modulus material selected from the group consisting of polyester, nylon, rayon, aramid and glass;

d) is deployed between the belt structure and the radial ply structure for supporting tensile loads during both normal-inflated and runflat operating conditions.

EP 335,588 ('588) to Sumitomo discloses a tire with belts 6 formed of two plies of steel cords and an "outer" band cord 7 wound outside of the belts between the belts and the tread. This is completely different from the present invention which is limited to "a fabric underlay deployed between the belt structure and the radial ply structure for supporting tensile loads during both normal-inflated and runflat operating conditions". The '588 patent is not directed to a runflat tire and therefore does not require the underlay of the present invention.

Accordingly, if one skilled in the art were to modify Welter or Iwata et al. or Cluzel with the teachings of Oare et al. and/or the '588 patent, the resulting structure would still not include an underlay deployed between the belt structure and the radial ply structure that:

a) comprises high-modulus reinforcing cords being aligned at a cord angle of about 0 degrees to 5 degrees with respect to the equatorial plane of the tire,

b) is a wound ribbon of cord-reinforced rubber wherein the ribbon is butt joined against laterally adjacent potions of the ribbon without overlapping;

c) the high-modulus reinforcing cords of the fabric underlay are made of high-modulus material selected from the group consisting of polyester, nylon, rayon, aramid and glass; and

d) is deployed between the belt structure and the radial ply structure for supporting tensile loads during both normal-inflated and runflat operating conditions.

GB 1,487,426 ('426) to Verbauwhede discloses a reinforcing layer in a tire between the carcass and the tread. However, there is no teaching or suggestion of providing a runflat tire comprising a tread, two insert reinforced sidewalls, a radial ply structure, a belt structure located between the tread and the radial ply structure, and "a fabric underlay deployed between the belt structure and the radial ply structure for supporting tensile loads during both normal-inflated and runflat operating conditions".

As before, if one skilled in the art were to modify Welter or Iwata et al. or Cluzel with the teachings of Oare et al. and/or the '588 patent, and/or the '426 patent, the resulting structure would still not include an underlay deployed between the belt structure and the radial ply structure that:

a) comprises high-modulus reinforcing cords being aligned at a cord angle of about 0 degrees to 5 degrees with respect to the equatorial plane of the tire,

b) is a wound ribbon of cord-reinforced rubber wherein the ribbon is butt joined against laterally adjacent potions of the ribbon without overlapping;

c) the high-modulus reinforcing cords of the fabric underlay are made of high-modulus material selected from the group consisting of polyester, nylon, rayon, aramid and glass; and

d) is deployed between the belt structure and the radial ply structure for supporting tensile loads during both normal-inflated and runflat operating conditions.

Claim 1 is allowable because the cited prior art taken alone or in combination doesn't teach or suggest include an underlay deployed between the belt structure and the radial ply structure that:

a) comprises high-modulus reinforcing cords being aligned at a cord angle of about 0 degrees to 5 degrees with respect to the equatorial plane of the tire,

b) is a wound ribbon of cord-reinforced rubber wherein the ribbon is butt joined against laterally adjacent potions of the ribbon without overlapping;

c) the high-modulus reinforcing cords of the fabric underlay are made of high-modulus material selected from the group consisting of polyester, nylon, rayon, aramid and glass; and

d) is deployed between the belt structure and the radial ply structure for supporting tensile loads during both normal-inflated and runflat operating conditions.

Accordingly, claim 1 should be deemed allowable.

Claim 2 is dependent upon claim 1 and sets forth that "the fabric underlay comprises opposing marginal edges which extend laterally beyond lateral edges of the belt structure." Since none of the references taken alone or in combination teach or suggest the underlay of claim 1, claim 2 should also be allowable.

Claim 4 is dependent upon claim 1 and sets forth that " the fabric underlay is located on the tensile side of the neutral bending axis of the combined belt structure, fabric underlay and ply structure." Since none of the references taken alone or in combination teach or suggest the underlay of claim 1, claim 4 should also be allowable.

Claim 5 is dependent upon claim 4 and sets forth that " the cords of the fabric underlay are circumferentially oriented and are prestressed in tension during manufacturing of the tire." Since none of the references taken alone or in combination teach or suggest the underlay of claim 1 or claim 4, claim 5 should also be allowable.

Claim 8 is dependent upon claim 1 and sets forth that " a fabric overlay is disposed between the belt structure and the tread." Since none of the references taken alone or in combination teach or suggest the underlay of claim 1, claim 8 should also be allowable.

Claim 9 is dependent upon claim 1 and sets forth that "at least one of the radial plies is reinforced by essentially inextensible cords." Since none of the references taken alone or in combination teach or suggest the underlay of claim 1, claim 9 should also be allowable.

Conclusion

The claims should be allowed.

No new matter is entered by this Amendment.

Applicant has made a diligent effort to amend the claims of this application so that they define novel structure which is non-obvious. If there are still some issues to be resolved, the Examiner is invited to contact the undersigned.

Respectfully submitted,

Howard M. Cohn

Registration No. 25,808

Howard M. Cohn

21625 Chagrin Blvd. Suite 220

Cleveland, Ohio 44122

(216)752-0955 phone

(216)752-0957 fax

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